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(54) LOW-SAFA CREAM ALTERNATIVES

ALTERNATIVEN FÜR CREME MIT NIEDRIGEM GEHALT AN GESÄTTIGTER FETTSÄURE

VARIANTES DE CREMES A FAIBLE TENEUR EN ACIDES GRAS SATURES (SAFA)

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- **PATENT ABSTRACTS OF JAPAN vol. 004, no. 174 (C-033)2 December 1980 & JP,A,55 114 261 (FUJI OIL CO LTD) 3 September 1980**

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Description

Whippable, water-continuous fat emulsions having fat contents of 25-50 wt.% and wherein the fat applied has a PUFA content of at least 30 mol.%, and in particular selected from grapeseed oil, maize oil, safflower oil, soybean oil and sunflower oil, are known from US 3,944,680.

In order to improve the rigidity of the cream after whipping, a small amount of a hardstock fat has to be present in the fat phase of the emulsion. An interesterified palmkernel melting point of 39°C is mentioned as an example of this hardstock .

The above-mentioned products, however, require a pH of 4.2-5.5, while 0.5-4.0 wt.% of a globular protein needs to be present, whereas coagulated protein should be absent. Whippable, non-dairy creams based on fats, that are mainly liquid oils, which can contain up to 15 wt% of a completely saturated hard fat, are known form EP 509,579. In order to obtain acceptable whiptimes and product-performance 0.005 - 3 wt% of an inorganic salt is incorporated in the creams. According to EP 32,808 improved water-continuous fat-emulsions, that display better whipping performance are obtained, when the fatphase contains butterfat.

In above prior art no solution is given for the preparation of whippable cream alternatives, wherein fats are applied that have low SAFA-contents, whereas the products do not contain butterfat and/or an inorganic salt. Further we have found a solution for the fact, that the use of the known fat mixtures imparts to the whipped creams too warm an eating sensation and too prolonged a mouthfeel. Moreover, the firmness of these prior art whipped creams is not yet satisfactory.

Therefore, our invention is concerned with whippable water-continuous fat emulsions that overcome the drawbacks of the above-mentioned products and have an improved eating quality and mouthfeel while the Stevens values of the whipped products made from these compositions are also increased. Moreover, our compositions no longer require the presence of a globular protein and can therefore be free from globular protein. The pH requirement of 4.2-5.5 is no longer imperative either. The pH of our novel products can be about neutral as well (i.e. pH = 6.5-7.5). Another important advantage is, that our novel creams are free of added inorganic salts.

Because of the application of a particular fat mixture, the SAFA level (= mol.% saturated fatty acids) of the fat phase of our novel compositions can remain under 35 mol.%, while simultaneously the fat phase of our products is free of trans-acids.

Therefore, our invention concerns a whippable, water-continuous fat emulsion comprising

10-40 wt.% of a fat mixture with a composition as obtainable by blending of at least fats A and B;
0.01-2 wt.% of a thickener;
0.01-2 wt.% of an emulsifier system;
1-8 wt.% of a milk protein compound wherein the fat mixture obtainable by blending of fats A and B consists of
10-35 wt.% of a fat A that is low in SAFA (= saturated fatty acids) and free from trans-acids, and
90-65 wt.% of fats B that are high in PUFA (= polyunsaturated fatty acids) and low in SAFA, the solid fat content of the fat mixture at 5°C (N_5) = 20-40 and at 35°C (= N_{35}) is less than 5 (both NMR pulse, not stabilized) and the SAFA content of the total fat mixture being less than 35 mol.%.

Fat A of our fat phase displays in particular the following N-values (NMR pulse, not stabilized) : $N_{35} < 15$ and N_5 = 60-100.

It is further preferred that fat A contains more than 50 wt.% of (St_2U + S_2U)-type triglycerides, S = saturated fatty acid C_{16}-C_{22}; U = mono- or polyunsaturated fatty acid having at least 18 C atoms. Very suitably, fats A are selected from the group consisting of palm mid-fractions, shea fractions, illipe, enzymically produced fats high in SUU and/or SUS triglycerides (S = saturated fatty acid C_{16}-C_{22}, U = unsaturated fatty acid having at least 18 C atoms, e.g. $C_{18:1}$; $C_{18:2}$; $C_{18:3}$; $C_{18:4}$; $C_{20:4}$; $C_{20:5}$ w3; $C_{22:6}$ w3) and mixtures thereof.

These fats are typically triglycerides high in at least one of the following triglycerides : P_2U, St_2U, A_2U, B_2U, PU_2; StU_2 or BU_2, wherein

P = palmitic acid;
St = stearic acid;
A = arachidic acid;
B = behenic acid;
U = mono- or polyunsaturated fatty acid, e.g. $C_{18:1}$; $C_{18:2}$; $C_{18:3}$.

However, also triglycerides with two different saturated fatty acid residues, e.g. PStU, BPU, BStU etc. can be applied. Preferred fats, however, are fats high in POP, StOSt; POSt; StLnSt; StStLn (Ln= $C_{18:2}$).

Fat B is a liquid oil typically having a SAFA content of less than 15 mol.%. As the oil is liquid, its N_{20} will be less than 5. Suitably, fats B are selected from the group consisting of soybean oil, sunflower oil, safflower oil, maize oil, rape-

seed oil, grapeseed oil, olive oil, groundnut oil and cottonseed oil or fractions thereof or mixtures thereof.

The best products are obtained when a small amount of thickener is present. Preferred amounts applied are 0.05-1 wt.%. Although any thickener, e.g. selected from the group consisting of one or more of the carrageenans, locust bean gum, guar gum, starches, modified starches, pectins, gelatins, xanthan gum, alginate, agar, gum acacia, gum tragacanth, gellan gum, cellulose ethers or mixtures thereof can be applied, we have a preference for the application of guar gum.

In order to achieve stability, our emulsions should contain an emulsifier, preferably in amounts of 0.05-1 wt.%. Typical emulsifiers are lactodan, lecithin, polyglycerol esters, DATA esters, polyoxyethylene sorbitan esters and monoglycerides (both from saturated and unsaturated fatty acids). However, we prefer to apply a combination of a stabilizing emulsifier, such as a monoglyceride from a saturated fatty acid and a destabilizing emulsifier, such as lecithin. Examples of such an emulsifier system can be found in our earlier European patent application 455,288.

In order to impart an improved taste to our products we preferably add 2-6 wt.% of buttermilk powder as milk protein component to our compositions.

Typical product characteristics of our novel emulsions are:

- whipping times, applying a Kenwood whipping machine KM-201, of less than 5 minutes, in particular less than 3 minutes;
- viscosities at 5°C and under a shear of 100 s^{-1} of 30-150 mPa.s.

Physical characteristics of whipped products obtainable by whipping of our emulsions are :

- overrun 140-230%
- Stevens values of more than 20, in particular 25-50.

It should be pointed out that other whippable, water-continuous fat emulsions are known from US 3,716,378. However, according to this patent the product must contain substantial amounts of butterfat, while a membrane substance, obtained by clarifixating of a milk with 2-7% of fat, must be present in the product. Further, the emulsion is churned. In our compositions only small amounts of butterfat (owing to the presence of BMP) are present. The membrane substance is completely absent in our compositions; moreover, our emulsions are not churned.

US 3,903,310 mentions high-PUFA whippable cream alternatives. Typically, the ratio P : S is greater than 0.3. In order to achieve a stable whip, a protein hydrolysate needs to be present. We have found compositions wherein no protein hydrolysate is present and that still display good product performances, such as organoleptic properties, SAFA content, whipping time and firmness.

DE 3,002,037 discloses whippable cream alternatives wherein the fat consists of a partially hardened fat having a slip melting point of 20-50°C, e.g. a sunflower oil slip melting point of 30°C. The slip melting point requirement, however, indicates that quite considerable amounts of trans-acids will be present in the fat phase. Our fat phase contains hardly any trans-fat.

In our earlier European patent application 469,656 we have disclosed non-dairy creams wherein considerable amounts of liquid oils can be present. However, in addition to the liquid oil, a hard fat (at least 15 wt.%) has to be present as well. As the hard fat is a fully hardened fat (e.g. hardened palmkernel fat), the SAFA content of the fat phase will be more than 35 mol.%. Moreover, the hard fat will not be free from trans-acids. Therefore, the products will be less healthy than the present products. A further advantage of the novel products according to our invention is that they need not be tempered.

EXAMPLES

An emulsion was made with the compositions according to the Table by making a premix of water, BMP, emulsifiers, fat phase and thickener.

The emulsion was heated to 80°C and treated with steam (150°C) for 3 seconds.

The emulsion obtained was homogenized in 1 stage at a pressure of 100 bar.

A sterilized, homogenized product was obtained, having a temperature of 80°C.

The product was cooled to 6°C and packed.

TABLE 1

Ingredients	Hardstock applied						
	1	2	3	4	5	6	7
BMP	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Guar gum	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Hardstock	6.0	7.5	10.4	10.4	10.4	10.4	9% of (5)
Sunflower oil	24.0	27.5	19.6	19.6	19.6	19.6	26.0
Lecithin	0.1	0.15	0.1	0.1	0.1	0.1	0.1
Monoglyceride	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water	63.6	58.6	63.6	63.6	63.6	63.6	58.6
PUFA content	50	51	42	42	42	42	48
SAFA content	30	30	30	30	30	30	24

Hardstocks applied
1* Interesterified palmkernel -38/hard palm oil -58 (50/50)
2* Palmkernel -38
3. Shea stearin
4. Shea stearin / Palm oil mid-fraction (70:30)
5. Blend of palm mid/shea sterain/Illipe: 45:35:20
6. Blend of palm mid/shea stearin: 20:80
7. Hardstock 5

* Not according to invention (SAFA content and/or trans-content of hardstock are (is) too high).

Results

Whipping times, overrun and firmness (Stevens values) were measured on the products by whipping with a Kenwood model KM-201, provided with a 500 Watt motor. The creams were whipped at 200 rpm under planetory mixing motion with a wire whisk.

The moment when maximum resistance to whipping occurred, stirring was stopped.

The results obtained are listed in Table 2.

TABLE 2

Properties	Hardstock						
	1	2	3	4	5	6	7
Whipping times (min.)	3.45	**	2.30	2.00	2.00	2.25	3.50
Overrun (%)	200		175	150	150	155	155
Firmness (Stevens)	14		33	40	30	46	20
Viscosity at 5°C 100 s^{-1} (mPa.s)	47	82	40	34	65	37	57

** did not whip.

Claims

1. Whippable, water-continuous fat emulsion comprising

10-40 wt.% of a fat mixture with a composition as obtainable by blending of at least fats A and B;
0.01-2 wt.% of a thickener;
0.01-2 wt.% of an emulsifier system;
1-8 wt.% of a milk protein compound wherein the fat mixture obtainable by blending of fats A and B comprises:
10-35 wt.% of a fat A that is low in SAFA (= saturated fatty acids) and free from trans-acids, and
90-65 wt.% of fats B that are high in PUFA (= polyunsaturated fatty acids) and low in SAFA, the solid fat content of the fat mixture at 5°C (N_5) = 20-40 and at 35°C (= N_{35}) being less than 5 (both NMR pulse, not stabilized) and the SAFA content of the total fat mixture being less than 35 mol.%.

2. Whippable, water-continuous fat emulsion according to Claim 1, wherein fat A displays the following N-values (NMR pulse, not stabilized) :

$$N_{35} < 15$$

$$N_5 = 60\text{-}100.$$

3. Whippable, water-continuous fat emulsion according to Claim 1 or 2, wherein fat A contains more than 50 wt.% of ($SU_2 + S_2U$)-type triglycerides, S = saturated fatty acid C_{16}-C_{22}; U = mono- or polyunsaturated fatty acid having at least 18 C atoms.

4. Whippable, water-continuous fat emulsion according to Claims 1-3, wherein fat A is a fat selected from the group consisting of palm mid-fractions, shea fractions, illipe, enzymically produced fats high in SUU and/or SUS triglycerides (S = saturated fatty acid C_{16}-C_{22}, U = unsaturated fatty acid having at least 18 C atoms) and mixtures thereof.

5. Whippable, water-continuous fat emulsion according to Claims 1-4, wherein fat A is a fat high in at least one of the following triglycerides : P_2U, St_2U, A_2U, B_2U, PU_2; StU_2 or BU_2, wherein

P = palmitic acid;
St = stearic acid;
A = arachidic acid;
B = behenic acid;
U = mono- or polyunsaturated fatty acid, e.g. $C_{18:1}$; $C_{18:2}$; $C_{18:3}$.

6. Whippable, water-continuous fat emulsion according to Claim 1, wherein fat B is a liquid oil having a SAFA content of less than 15 mol.%.

7. Whippable, water-continuous fat emulsion according to Claim 6, wherein fat B is selected from the group consisting of soybean oil, sunflower oil, safflower oil, maize oil, rapeseed oil, grapeseed oil, olive oil, groundnut oil and cottonseed oil or fractions thereof or mixtures thereof.

8. Whippable, water-continuous fat emulsion according to Claim 1, wherein the thickener is selected from the group consisting of one or more of the carrageenans, locust bean gum, guar gum, starches, modified starches, pectins, gelatins, xanthan gum, alginate, agar, gum acacia, gum tragacanth, gellan gum, cellulose ethers or mixtures thereof.

9. Whippable, water-continuous fat emulsion according to Claim 1, wherein the emulsifier system comprises at least one emulsifier chosen from the group consisting of lactodan, lecithin, polyglycerol esters, DATA esters, polyoxyethylene sorbitan esters and monoglycerides (both from saturated and unsaturated fatty acids).

10. Whippable, water-continuous fat emulsion according to Claim 1, wherein the milk protein compound is buttermilk powder (BMP).

11. Whippable, water-continuous fat emulsion according to Claims 1-10, wherein the emulsion displays a whipping time, applying a Kenwood whipping machine model KM-210, of less than 5 minutes, while its viscosity at 5°C and 100 s^{-1} ranges from 30-150 mPa.s, whereas the whipped structure, obtainable after whipping, is characterized by an overrun of 140-280 % and a Stevens value of more than 20, in particular 25-50.

Patentansprüche

1. Schlagbare, wasserkontinuierliche Fettemulsion, umfassend

   10 bis 40 Gew.-% einer Fettmischung mit einer Zusammensetzung, wie sie durch Mischen mindestens der Fette A und B erhältlich ist;
   0,01 bis 2 Gew.-% eines Verdickungsmittels,
   0,01 bis 2 Gew.-% eines Emulgatorsystems,
   1 bis 8 Gew.-% einer Milchproteinverbindung, worin die durch Mischen der Fette A und B erhältliche Fettmischung umfaßt:
   10 bis 35 Gew.-% eines Fettes A mit niedrigem SAFA-Gehalt (SAFA = gesättigte Fettsäuren), das von trans-Säuren frei ist, und
   90 bis 65 Gew.-% an Fetten B mit hohem PUFA-Gehalt (PUFA = mehrfach ungesättigte Fettsäuren) und niedrigem SAFA-Gehalt, wobei der Festfettgehalt der Fettmischung bei 5°C (N_5) 20 bis 40 beträgt und bei 35°C (N_{35}) kleiner als 6 ist (beide durch NMR-Impuls, nicht stabilisiert) und der SAFA-Gehalt der gesamten Fettmischung kleiner als 35 Mol-% ist.

2. Schlagbare, wasserkontinuierliche Fettemulsion nach Anspruch 1, worin das Fett A die folgenden N-Werte (NMR-Impuls, nicht stabilisiert) zeigt:

$$N_{35} < 15$$

$$N_5 = 60 \text{ bis } 100.$$

3. Schlagbare, wasserkontinuierliche Fettemulsion nach Anspruch 1 oder 2, worin das Fett A mehr als 50 Gew.-% Triglyceride des (SU_2 + S_2U)-Typs enthält (S = gesättigte C_{16}-C_{22}-Fettsäure, U = einfach oder mehrfach ungesättigte Fettsäure mit mindestens 18 C-Atomen).

4. Schlagebare, wasserkontinuierliche Fettemulsion nach einem der Ansprüche 1 bis 3, worin das Fett A ein Fett ist, das aus der aus Palmmittelfraktionen, Sheafraktionen, Illipe, enzymatisch hergestellten Fetten mit hohem Gehalt an SUU- und/oder SUS-Triglyceriden (S = gesättigte C_{16}-C_{22}-Fettsäure, U = ungesättigte Fettsäure mit mindestens 18 C-Atomen) und Mischungen davon bestehenden Gruppe ausgewählt ist.

5. Schlagbare, wasserkontinuierliche Fettemulsion nach einem der Ansprüche 1 bis 4, worin das Fett A ein Fett mit hohem Gehalt an mindestens einem der folgenden Triglyceride ist: P_2U, St_2U, A_2U, B_2U, PU_2, StU_2 oder BU_2, worin bedeuten:

   P = Palmitinsäure
   St = Stearinsäure
   A = Arachinsäure
   B = Behensäure
   U = einfach oder mehrfach ungesättigte Fettsäure, z.B. $C_{18:1}$, $C_{18:2}$, $C_{18:3}$.

6. Schlagbare, wasserkontinuierliche Fettemulsion nach Anspruch 1, worin das Fett B ein flüssiges Öl mit einem SAFA-Gehalt von weniger als 15 Mol-% ist.

7. Schlagbare, wasserkontinuierliche Fettemulsion nach Anspruch 6, worin das Fett B aus der aus Sojaöl, Sonnenblumenöl, Saffloröl, Maisöl, Rapsöl, Traubenkernöl, Olivenöl, Erdnußöl und Baumwollsamenöl oder Fraktionen oder Mischungen davon bestehenden Gruppe ausgewählt ist.

8. Schlagbare, wasserkontinuierliche Fettemulsion nach Anspruch 1, worin das Verdickungsmittel aus der Gruppe ausgewählt ist, die aus einem oder mehreren Carrageenanen, Johannisbrotgummi, Guargummi, Stärken, modifizierten Stärken, Pektinen, Gelatinen, Xanthangummi, Alginat, Agar, Akaziengummi, Tragacanthgummi, Gellangummi, Celluloseethern oder Mischungen davon besteht.

9. Schlagbare, wasserkontinuierliche Fettemulsion nach Anspruch 1, worin das Emulgatorsystem mindestens einen Emulgator umfaßt, der aus der aus Lactodan, Lezithin, Polyglycerolestern, DATA-Estern, Polyoxyethylensorbitanestern und Monoglyceriden (beide von gesättigten und ungesättigten Fettsäuren) bestehenden Gruppe ausgewählt ist.

10. Schlagbare, wasserkontinuierliche Fettemulsion nach Anspruch 1, worin die Milchproteinverbindung Buttermilchpulver (BMP) ist.

11. Schlagbare, wasserkontinuierliche Fettemulsion nach einem der Ansprüche 1 bis 10, worin die Emulsion unter Verwendung einer Kenwood-Schlagvorrichtung, Modell KM-210, eine Schlagzeit von weniger als 5 Minuten zeigt, wobei ihre Viskosität bei 5°C und 100 s^{-1} von 30 bis 150 mPa.s reicht, während die nach dem Schlagen erhältliche geschlagene Struktur durch einen Überlauf von 140 bis 230 % und einen Stevens-Wert von mehr als 20, insbesondere 25 bis 50, gekennzeichnet ist.

Revendications

1. Emulsion grasse fouettable à phase aqueuse continue comprenant

   10 à 40 % en masse d'un mélange de graisses avec une composition pouvant être obtenue en mélangeant au moins les graisses A et B ;
   0,01 à 2 % en masse d'un agent épaississant ;
   0,01 à 2 % en masse d'un système d'émulsifiants ;
   1 à 8 % en masse d'un composé de protéine de lait dans laquelle le mélange de graisses pouvant être obtenu en mélangeant les graisses A et B se compose de
   10 à 35 % en masse d'une graisse A présentant une faible teneur en acides gras saturés (SAFA) et exempte de trans-acides, et
   90 à 65 % en masse de graisses B présentant une forte teneur en acides gras polyinsaturés (PUFA) et présentant une faible teneur en acides gras saturés, la teneur en graisse solide du mélange de graisses présentant une valeur (N_5) = 20 à 40 à une température de 5 ° C et une valeur (= N_{35}) inférieure à 5 à une température de 35 ° C (chaque fois avec impulsion RMN, non stabilisée) et la teneur en SAFA du mélange de graisses total étant inférieur à 35 moles %.

2. Emulsion grasse fouettable à phase aqueuse continue selon la Revendication 1, dans laquelle la graisse A présente les valeurs N suivantes (impulsion RMN, non stabilisée) : $N_{35} < 15$ et $N_5 = 60$ à 100.

3. Emulsion grasse fouettable à phase aqueuse continue selon la Revendication 1 ou 2, dans laquelle la graisse A contient plus de 50 % en masse de triglycérides de type ($SU_2 + S_2U$), S correspondant à un acide gras saturé en C_{16}-C_{22} ; U correspondant à un acide gras mono- ou polyinsaturé contenant au moins 18 atomes de carbone.

4. Emulsion grasse fouettable à phase aqueuse continue selon les Revendications 1 à 3, dans laquelle la graisse A est une graisse sélectionnée parmi le groupe composé de fractions moyennes de palme, de fractions de karité, d'illipé, de graisses produites de façon enzymatique présentant une forte teneur en SUU et/ou en triglycérides SUS (S correspondant à un acide gras saturé en C_{16}- C_{22} ; U correspondant à un acide gras insaturé contenant au moins 18 atomes de carbone) et des mélanges de ceux-ci.

5. Emulsion grasse fouettable à phase aqueuse continue selon les Revendications 1 à 4, dans laquelle la graisse A est une graisse présentant une forte teneur en au moins l'un des triglycérides suivants : P_2U, St_2U, A_2U, B_2U, PU_2 ; StU_2 ou BU_2, où

   P = acide palmitique ;
   St = acide stéarique ;
   A = acide arachidique ;
   B = acide béhénique ;
   U = acide gras mono- ou polyinsaturé, par ex. $C_{18:1}$; $C_{18:2}$; $C_{18:3}$.

6. Emulsion grasse fouettable à phase aqueuse continue selon la Revendication 1, dans laquelle la graisse B est une huile liquide présentant une teneur en SAFA inférieure à 15 moles %.

7. Emulsion grasse fouettable à phase aqueuse continue selon la Revendication 6, dans laquelle la graisse B est sélectionnée parmi le groupe composé d'huile de soja, d'huile de tournesol, d'huile de carthame, d'huile de maïs, d'huile de colza, d'huile de pépins de raisin, d'huile d'olive, d'huile d'arachide et d'huile de coton ou de fractions ou de mélanges de celles-ci.

8. Emulsion grasse fouettable à phase aqueuse continue selon la Revendication 1, dans laquelle l'agent épaississant

est sélectionné parmi le groupe composé de l'un ou de plusieurs des éléments suivants : carraghénanes, gomme de caroube, gomme de guar, amidons, amidons modifiés, pectines, gélatines, gomme de xanthane, alginate, agar, gomme d'acacia, gomme d'adragant, gomme de gellane, éthers de cellulose ou des mélanges de ceux-ci.

9. Emulsion grasse fouettable à phase aqueuse continue selon la Revendication 1, dans laquelle le système d'émulsifiants comprend au moins un émulsifiant sélectionné parmi le groupe composé de lactodan, de lécithine, d'esters de polyglycérol, d'esters DATA, d'esters sorbitan de polyoxyéthylène et de monoglycérides (provenant à la fois d'acides gras saturés et insaturés).

10. Emulsion grasse fouettable à phase aqueuse continue selon la Revendication 1, dans laquelle le composé de protéine de lait est de la poudre de babeurre.

11. Emulsion grasse fouettable à phase aqueuse continue selon les Revendications 1 à 10, dans laquelle l'émulsion présente un temps de fouettage inférieur à 5 minutes en utilisant une machine à fouetter Kenwood modèle KM-201, alors que sa viscosité à une température de 5 ° C et sous un cisaillement de 100 s^{-1} est comprise entre 30 et 150 mPas, la structure fouettée, obtenue à la suite du fouettage, étant caractérisée par un foisonnement compris entre 140 et 230 % et une valeur de Stevens supérieure à 20, en particulier comprise entre 25 et 50.